

PAT-NO: JP410294396A
DOCUMENT-IDENTIFIER: JP 10294396 A
TITLE: THIN FILM MULTILAYERED BOARD AND ELECTRONIC
DEVICE
PUBN-DATE: November 4, 1998

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APPL-NO: JP09101955

APPL-DATE: April 18, 1997

INT-CL (IPC): H01L023/12, H05K003/34 , H05K003/46

ABSTRACT:

PROBLEM TO BE SOLVED: To ensure the joint of a pin which serves as an input/output terminal of sufficient strength, by a method wherein the base of a via structure connected to one of conductor layers of thin film structure is laminated directly on a board parent material, and the pin is secured onto the via structure.

SOLUTION: Conductor layers 24a to 24f of a via structure 22 are formed corresponding to the conductor layers 18a to 18f together with them at the same time, where the conductor layers 24a to 24f are directly and

separately laminated. The via structure 22 is provided without insulating layer interposed between the uppermost conductor layer 24a and a board parent material 12. The stepped part of the conductor layers 24a to 24f serves as the via structure, and the center flat of the conductor layers 24a to 24f is made to serve as a pad where a pin 16 is mounted. The uppermost conductor layer 24a is plated with nickel and gold. Moreover, the pin 16 is provided with a mounting seat 16a at its lower end, and the mounting seat 16a is soldered to the uppermost conductor layer 24a with solder 26. By this setup, the joint of a pin can be enhanced in strength, so that an electronic device of this constitution can be used in an environment where it is high in temperature and humidity.

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(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平10-294396

(43) 公開日 平成10年(1998)11月4日

(51) Int.Cl. ⁶	識別記号	F I	
H 0 1 L 23/12		H 0 1 L 23/12	P
H 0 5 K 3/34	5 0 1	H 0 5 K 3/34	5 0 1 E
3/46		3/46	E
			N
			Q

審査請求 未請求 請求項の数 8 O L (全 7 頁) 最終頁に続く

(21) 出願番号 特願平9-101955

(22) 出願日 平成9年(1997)4月18日

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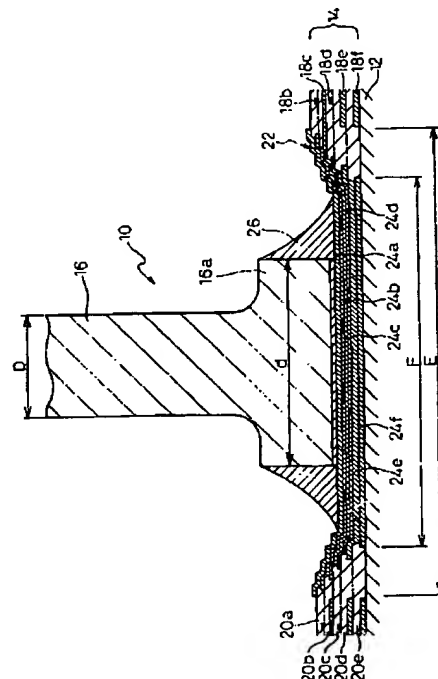
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(54) 【発明の名称】 薄膜多層基板及び電子装置

(57) 【要約】

【課題】 薄膜多層基板及び電子装置に関し、入出力端子として使用されるピンの接合部分の強度を確保できるようにすることを目的とする。

【解決手段】 絶縁性の基板母材12と、該基板母材上に設けられた複数の導体層18b～18fと複数の絶縁体層20a～20eとからなる薄膜構造14と、該薄膜構造内に設けられ、該薄膜構造の複数の導体層の一つに接続されるビア構造22と、該ビア構造に接続されるピン16とを備え、該ビア構造の底部は該基板母材上に直接積層された複数の導体層24a～24fからなるとともに該ビア構造上に該ピンが固着される構成とする。



【特許請求の範囲】

【請求項1】 絶縁性の基板母材と、該基板母材に設けられた複数の導体層と複数の絶縁体層とからなる薄膜構造と、該薄膜構造内に設けられ、該薄膜構造の複数の導体層の一つに接続されるビア構造と、該ビア構造に接続されるピンとを備え、該ビア構造の底部は該基板母材上に直接積層されるときに該ビア構造上に該ピンが固着されることを特徴とする薄膜多層基板。

【請求項2】 該ビア構造の複数の導体層は、該薄膜構造の複数の導体層と対応し、該ビア構造の該導体層はそれぞれが直接積層されることを特徴とする請求項1に記載の薄膜多層基板。

【請求項3】 該ビア構造の複数の導体層の各々の面積は該ピンの端部の面積と同じかそれよりも大きいことを特徴とする請求項2に記載の薄膜多層基板。

【請求項4】 該ビア構造の複数の導体層の面積は該基板母材に近い導体層から該基板母材から遠ざかる導体層へ順に大きくなることを特徴とする請求項3に記載の薄膜多層基板。

【請求項5】 該ビア構造の複数の導体層の該基板母材から最も遠い導体層は、ニッケルメッキ及び金メッキを施されていることを特徴とする請求項4に記載の薄膜多層基板。

【請求項6】 該薄膜構造の複数の導体層は、該ビア構造の該基板母材に最も近い導体層並びに該ビア構造に接続される導体層を除いて、該ビア構造の複数の導体層の該基板母材から最も遠い導体層の投影面の外側に配置されることを特徴とする請求項4に記載の薄膜多層基板。

【請求項7】 該ビア構造に接続される該薄膜構造の複数の導体層の一つは、該ビア構造の複数の導体層の該基板母材から最も遠い導体層の投影面内では、薄膜構造鉛直する方向に移動することなく同一層内でビア構造に接続されることを特徴とする請求項4に記載の薄膜多層基板。

【請求項8】 絶縁性の基板母材と、該基板母材に設けられた複数の導体層と複数の絶縁体層とからなる薄膜構造と、該薄膜構造の表面に配置される少なくとも一つの電子部材と、該薄膜構造内に設けられ、該複数の導体層の一つに接続されるビア構造と、該ビア構造に接続されるピンとを備え、該ビア構造は該基板母材上に積層された複数の導体層からなることを特徴とする電子装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明はピンを入出力端子として利用している薄膜多層基板及び電子装置に関する。

【0002】

【従来の技術】近年、装置や機器の小型化及び軽量化、並びにLSIの多端子化や微細化に対応して、薄膜多層基板が使用されている。薄膜多層基板は、絶縁性の基板母材と、該基板母材に設けられた複数の導体層と複数の

絶縁体層とからなる薄膜構造とからなり、各導体層の層間をビア構造（ビアホール）で接続することにより、微細ピッチ配線を行うのに適している。

【0003】薄膜多層基板の基板母材としては、アルミナやムライト等の無機材料が使用される。あるいは、そのような基板母材として、FR4などの有機材料を使用することもできる。薄膜構造は銅やアルミニウムなどの導体層と、ポリイミドやエポキシなどの絶縁層を積層して作られており、導体層は電源供給や信号配線のためのパターンとして形成され、異なった導体層はビア構造で接続される。

【0004】薄膜構造の表面にはパッドが形成され、LSIチップ等の電子部品や抵抗やキャパシタ等がパッドに接続される。さらに、薄膜多層基板は入出力端子としてピンを含む。ピンもLSIチップと同様に、薄膜構造の表面のパッドに接続される。例えば、図5は薄膜構造にピンを設ける従来技術を示す図である。図5において、薄膜多層基板110の基板母材112上の薄膜構造114は、複数の導体層118b～118fと複数の絶縁体層120a～120eとからなる。入出力端子としてのピン116は薄膜構造114の表面のパッド124に搭載され、薄膜構造114に設けたビア構造122によって複数の導体層の一つに接続される。ビア構造122は表面にある絶縁層から接続すべき導体層まで掘り下げることによって形成される。ビア構造122の下には、導体層118e、118fが信号配線等として形成されている。こうして、薄膜多層基板は、LSI等の電子部品とともにマルチチップモジュール等の電子装置として使用される。このような電子装置は、入出力端子としてのピンによってプリント基板やマザーボードに取り付けて使用される。LSIチップと入出力ピンは同一面に搭載されるものと別々（両面）に実装されるものとがある。

【0005】なお、薄膜多層基板に関する従来技術として、特開平5-283557号公報、特開平6-13755号公報、特開平7-79078号公報、特開平7-86737号公報等がある。ただし、これらの従来技術は本発明に特に参考になるものとは言えない。

【0006】

【発明が解決しようとする課題】入出力端子としてのピンは薄膜構造の表面のパッドに取り付けられ、薄膜構造に設けたビア構造によって複数の導体層の一つに接続される。薄膜構造の表面のパッドの面積はピンの下端部の面積よりもわずかに大きく、ピンはパッドにはんだ付けされることができる。一方、ビア構造は通常層間の接続を行うのに用いる微細な構造であり、薄膜構造の表面にパッドを有するような広い面積を確保できる場合には複数の層間を接続するような多層のビア構造とすることができる。しかし、薄膜構造の表面から所望の導体層まで接続するビア構造は、パッドの面積に対して非常に微細な

構造であり、パッドとビア構造との面積差が非常に大きい。

【0007】パッドの下方には、ビア構造ばかりでなく、薄膜構造の導体層及び絶縁層が配置されている。また、ビア構造は接続すべき導体層までしか延びておらず、その導体層の下には絶縁層を介して別の導体層、すなわち多数の信号配線が配置される。薄膜多層基板を含む電子装置をプリント基板等に取り付ける場合、ビンの他端部をプリント基板にはんだ付けで接続する方法がある。この場合、はんだを溶かさない限り電子装置をプリント基板から取り外したり交換したりすることはできない。一方、顧客の機器使用頻度は非常に高くなっており、修理や高性能品との交換に要する時間もできるだけ短いことが望ましい。また、交換も特殊工具や特殊技術を必要としないことがよい。

【0008】そのためには、はんだ付けではなく、薄膜多層基板を含む電子装置をソケットやコネクタに装着できる構造が望まれる。この場合ピンとプリント基板との導通を、ソケットのコンタクトをピンに圧接することのみではんだ付けするのと同程度確保しなければなら

ない。そのために、こじめるような力が常時ピンへ付与されるようになり、はんだ付けにより接続する場合に比べて数十倍の力が加わるようになってしまう。薄膜多層基板では、高温高湿の悪環境下で荷重を受けると、絶縁層材料の吸湿により絶縁層と導体層との間の界面で密着力が低下し、長期信頼度を満足できる強度を保持できなかった。しかしながら、従来の薄膜多層基板では微細な多端

子配線を得るための工夫が優先され、ピン及びビア構造において生じる強度の問題には工夫がなかった。

【0009】本発明の目的は、入出力端子として使用されるビンの接合部分の強度を確保できるようにした薄膜多層基板及びそれを含む電子装置を提供することである。

【0010】

【課題を解決するための手段】本発明による薄膜多層基板は、絶縁性の基板母材と、該基板母材に設けられた複数の導体層と複数の絶縁層とからなる薄膜構造と、該薄膜構造内に設けられ、該薄膜構造の複数の導体層の一つに接続されるビア構造と、該ビア構造に接続されるピンとを備え、該ビア構造の底部は該基板母材上に直接積層されるとともに該ビア構造上に該ピンが固着されることを特徴とするものである。

【0011】また、本発明による電子装置は、そのような薄膜多層基板とともに、薄膜構造の表面に配置される少なくとも一つの電子部材を含むことを特徴とするものである。上記構成においては、ビア構造は該基板母材上に積層された複数の導体層からなるものであり、ピンは基板母材に直接に支持されているのと同等の剛性で支持される。また、入出力端子としてのビンの下方でビア構造の部分には絶縁層がない。絶縁層が吸湿する材料で作

られる場合には、ピンからそのような部位へ力がかかると、絶縁層と導体層との間の界面での密着力が低下する問題があるが、本発明ではピンから力がかかるような部位に絶縁層と導体層との間の界面がないので、そのような密着力の低下がなく、十分な強度を長期間保持することができる。よって、ピンが常時力を受けるような環境においても、十分な強度を有する薄膜多層基板及び電子装置を提供できる。

【0012】上記構成においては、下記の特徴を含むものとする。該ビア構造の複数の導体層は、該薄膜構造の導体層はそれぞれが直接に積層される。すなわち、該ビア構造は絶縁層を含まない。該ビア構造の複数の導体層の各々の面積は該ビンの端部の面積と同じかそれよりも大きい。

【0013】該ビア構造の複数の導体層の面積は該基板母材に近い導体層から該基板母材から遠ざかる導体層へ順に大きくなる。該ビア構造の複数の導体層の該基板母材から最も遠い導体層は、ニッケルメッキ及び金メッキを施されている。該薄膜構造の複数の導体層は、該ビア構造の該基板母材に最も近い導体層並びに該ビア構造に接続される導体層を除いて、該ビア構造の複数の導体層の該基板母材から最も遠い導体層の投影面の外側に配置される。

【0014】該ビア構造に接続される該薄膜構造の複数の導体層の一つは、該ビア構造の複数の導体層の該基板母材から最も遠い導体層の投影面内では、薄膜構造鉛直する方向に移動することなく同一層内でビア構造に接続される。特に、ビンの接続されるパッドから下部のビア構造へ順序に面積を変化させているため、ピン接合時の熱応力やコネクタ保持力が負荷されている状態でも、ビア構造に応力の局所集中が発生しない。また、パッド下に湿度によって大きな物性変化を生じさせる材料（絶縁層）も存在しないため、強度の著しい経年変化は発生しない。従って、高温高湿下といった劣悪環境下でもピン接合強度は長期的に劣化し続けることはなく、ソケットやコネクタ挿抜が可能な構造を実現する。さらに、強靱な耐久力を確保したい場合には、ピン接合後にピン根元部及び薄膜表面をエポキシやシリコンを主剤とした材料でコーティングしてもよい。

【0015】

【発明の実施の形態】図3は、本発明による薄膜多層基板10、並びに薄膜多層基板10を含む電子装置30を示す図である。薄膜多層基板10は絶縁性の基板母材12と、基板母材12上に設けられた薄膜構造14と、入出力端子としてのピン16とを備える。電子装置30は、薄膜多層基板10及び薄膜多層基板10に搭載されたLSI等の電子部品32並びに抵抗やキャパシタ等からなり、マルチチップモジュールを構成する。電子部品32は例えばはんだバンプ34により薄膜多層基板10の表面の導体層（パッド）に接合される。

【0016】さらに、このような電子装置30は、コンピュータのマザーボード40に取り付けられることができる。その際、ピン16がマザーボード40のコネクタ42、又はプリント基板のスルーホールに挿入され、それによってピン16を介して電子装置30とコンピュータとの間で信号等の伝達を行うことができる。また、図4に示されるように、ピン16がマザーボード40のパッド44にはんだ付けされ、それによってピン16を介して電子装置30とコンピュータとの間で信号等の伝達を行うことができる。図3の構成及び図4の構成のいずれにおいても、ピン16には荷重がかかり、薄膜多層基板10の薄膜構造14の強度が低下しやすくなるという問題がある。本発明は以下に述べる構成によってそのような問題点を解決するものである。

【0017】図1及び図2において、薄膜多層基板10の薄膜構造14は、複数の導体層18b~18fと複数の絶縁体層20a~20eとからなる。絶縁体層20a~20eは隣接する2つの導体層18b~18fを分離しており、導体層18b~18fのないところでは絶縁体層20a~20eは互いに連続する。図1及び図2はピン16の設置部分を拡大して示しており、図3及び図4に示される電子部品32等の搭載部分は示されていない。最上層の絶縁体層20aの上には、電子部品32の取り付けのためのパッドとなるもう一つの導体層18a(図1及び図2にはあらわれない)がある。導体層18a~18fは、電源供給やグランド及び信号配線のためのパターンとして形成され、層間のパターンを接続するために異なる導体層18a~18fは絶縁体層20a~20eを貫通するビア構造で接続される。

【0018】薄膜多層基板10の基板母材12としては、アルミナやムライト等の無機材料、あるいは、FR4などの有機材料を使用することができる。導体層18a~18fは銅やアルミニウムなどの金属でつくられ、パッドとなる導体層18aははんだ濡れ性を改善するためにニッケルメッキ及び金メッキを施される。絶縁体層20a~20eはポリイミドやエポキシなどの樹脂でつくられる。

【0019】ピン16はビア構造22によって薄膜構造14の複数の導体層18b~18fの一つに接続される。図1においては、ビア構造22は薄膜構造14の導体層18cに接続される。図2においては、ビア構造22は薄膜構造14の導体層18eに接続される。接続されるべき導体層18b~18fは電源供給端子やグランド端子及び信号端子のいずれかとなる。

【0020】ビア構造22は、基板母材12上に積層された複数の導体層24a~24fからなる。これらの導体層24a~24fは、薄膜構造14の導体層18a~18fと同時に形成されたものであり、薄膜構造14の底部にある導体層24fは基板母材12に直接積層される。ビア構造22は導体層24a~24fのうちの階段

状の部分であり、導体層24a~24fの中央の平坦部分はピン16の取り付けのためのパッドとなる。ビア構造22の方がパッドよりも大きい。最上層の導体層24aは、はんだ濡れ性を改善するためにニッケルメッキ及び金メッキを施される。薄膜構造14の導体層18a~18fは例えばフォトリソグラフィプロセスによりパターンニングされるとともに、ビア構造22の導体層24a~24fから分離されている。

【0021】従って、ビア構造22の複数の導体層24a~24fは、薄膜構造14の複数の導体層18a~18fと対応してそれぞれの導体層と同時に形成され、ビア構造22の各導体層24a~24fはそれぞれが直接に積層される。ビア構造22は最上方の導体層24aと基板母材12との間で絶縁層を含まない。ピン16はその下端部に取り付け座部16aを有し、取り付け座部16aが最上方の導体層24aにはんだ26によってはんだ付けされる。

【0022】上記構成においては、ビア構造22は基板母材12から直に積層された複数の導体層24a~24fからなるものであり、ピン16は基板母材12に直接に支持されているのと同等の剛性で支持される。また、絶縁層が吸湿する材料で作られる場合には、ピン16から力を受けると絶縁層と導体層との間の界面での密着力が低下するが、本発明ではピン16の下方のビア構造22の部分には絶縁層がないのでそのような密着力の低下がなく、高温高湿の劣悪条件下でもピン接合強度が劣化することがなく、十分な強度を長期間保持することができる。

【0023】また、ピン16に繰り返しの力がかかってもピン16の下方において薄膜多層基板10の強度の著しい経年劣化は生じなく、ピン16を図3のコネクタ32やスルーホールに挿抜する構造を実現することができる。つまり、ピン16をコネクタ32やスルーホールに挿抜する際には、ピン16に横方向の力がかかるが、本発明ではピン16に横方向の力がかかっても十分な耐久性を保持することができる。さらに強靱な耐久構造とするためには、ピン16をはんだ付け後にピン16の根元部及び薄膜表面をエポキシやシリコンを主剤とした材料でコーティングしてもよい。よって、ピンが常時力を受けるような環境においても、十分な強度を有する薄膜多層基板及び電子装置を提供できる。

【0024】さらに、実施例においては、ビア構造22の複数の導体層24a~24fの各々の面積はピン16の下端部の取り付け座部16aの面積と同じかそれよりも大きい。ピン16が最上方の導体層24aにはんだ付けされるときに、はんだが再凝固するときの引っ張り熱応力が問題となる。ビア構造の面積が小さいと、引っ張り応力が絶縁層にまで及び、ポリイミド等の絶縁層で応力集中が起こり、クラック等を発生する。この実施例のように、ビア構造22の面積をピン16の下端部の取り

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鉛直する方向に移動することなく同一層内でビア構造 2 2 に接続される。つまり、ビア構造 2 2 の近傍では信号の乗り換えを禁止することにより、パターンへの応力集中も回避可能となる。

【0028】

【発明の効果】以上説明したように、本発明によれば、薄膜構造上に接続されるピンであっても高温高湿環境に耐えうる薄膜多層基板及び電子装置を提供できる。

【図面の簡単な説明】

【図１】本発明の第１実施例の薄膜多層基板の一部を示す図である。

【図2】本発明の第2実施例の薄膜多層基板の一部を示す図である。

【図3】薄膜多層基板を含む電子装置をマザーボードに取り付けたところを示す図である。

【図4】薄膜多層基板を含む電子装置をマザーボードに取り付けたところを示す図である。

【図5】従来技術を示す図である。

【符号の説明】

10...薄膜多層基板

1 2…基板母材

1 4…薄膜構造

16...ピン

18b~18f...導体層

20a~20e…絶縁体層

24 a~24 f…導体層

30…電子装置

【図 1】

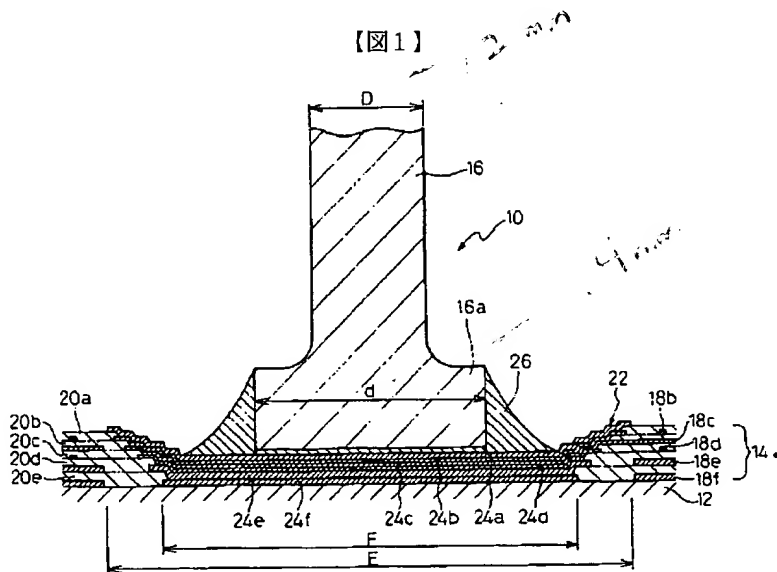


Fig. 1 is a schematic cross-sectional view of a multi-layered structure. It shows a top layer 10, a middle layer 12, and a bottom layer 40. A central region 30 contains two rectangular blocks 32, each with a series of small circles 34. Vertical structures 14 and 16 are on the left, and a wavy line 42 is on the right.

Figure 11 is a cross-sectional view of a semiconductor device. It shows a substrate 112 with a trench 122. A layer 116 is on top of the substrate, and a layer 124 is on top of the trench. The trench is filled with a material 118, which is divided into layers 118a, 118b, 118c, 118d, 118e, and 118f. The trench is also labeled 120a, 120b, 120c, 120d, and 120e.

フロントページの続き

(51)Int.Cl.⁶

識別記号

F I

H O 1 L 23/12

N

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the thin film multilayer substrate and electronic instrument which use the pin as an input/output terminal.

[0002]

[Description of the Prior Art] In recent years, corresponding to the formation of a many-items child and detailed-izing of LSI, the thin film multilayer substrate is used for the miniaturization of equipment or a device and lightweight-izing, and a list. The thin film multilayer substrate is suitable for performing detailed pitch wiring by consisting of a diaphragm structure which consists of two or more conductor layers prepared in an insulating substrate base material and this insulating substrate base material, and two or more insulator layers, and connecting between the layers of each conductor layer with beer structure (beer hall).

[0003] Inorganic materials, such as an alumina and a mullite, are used as a substrate base material of a thin film multilayer substrate. Or organic materials, such as FR4, can also be used as such a substrate base material. A diaphragm structure carries out the laminating of conductor layers, such as copper and aluminum, and the insulating layers, such as polyimide and epoxy, and is made, a conductor layer is formed as a pattern for current supply or signal wiring, and a different conductor layer is connected with beer structure.

[0004] A pad is formed on the surface of a diaphragm structure, and electronic parts, such as an LSI chip, resistance, a capacitor, etc. are connected to a pad. Furthermore, a thin film multilayer substrate contains a pin as an input/output terminal. A pin as well as an LSI chip is connected to the pad of the front face of a diaphragm structure. For example, drawing 5 is drawing showing the conventional technique of preparing a pin in a diaphragm structure. In drawing 5, the diaphragm structure 114 on the substrate base material 112 of the thin film multilayer substrate 110 consists of two or more conductor layers 118b-118f and two or more insulator layers 120a-120e. The pin 116 as an input/output terminal is carried in the pad 124 of the front face of a diaphragm structure 114, and is connected to one of two or more of the conductor layers according to the beer structure 122 prepared in the diaphragm structure 114. The beer structure 122 is formed by investigating to the conductor layer which should connect from the insulating layer in a front face. Conductor layers 118e and 118f are formed in the bottom of the beer structure 122 as signal wiring etc. In this way, a thin film multilayer substrate is used as electronic instruments, such as a multi chip module, with electronic parts, such as LSI. Such an electronic instrument is used by the pin as an input/output terminal, attaching in a printed circuit board or a mother boat. that by which an LSI chip and an I/O pin are carried in the same field -- being separate (both sides) -- there are some which are mounted.

[0005] In addition, there are JP,5-283557,A, JP,6-13755,A, JP,7-79078,A, JP,7-86737,A, etc. as a conventional technique about a thin film multilayer substrate. However, especially these conventional techniques cannot be said to this invention as what is consulted.

[0006]

[Problem(s) to be Solved by the Invention] The pin as an input/output terminal is attached in the pad of the front face of a diaphragm structure, and is connected to one of two or more of the conductor layers according to the beer structure prepared in the diaphragm structure. The area of the pad of the front face of a diaphragm structure is more slightly [than the area of the lower limit section of a pin] large, and a pin can be soldered to a pad. On the other hand, beer structure is the detailed structure of using for usually making connection between layers, and when a large area which has a pad on the surface of a diaphragm structure can be secured, it can be made into the multilayer beer structure where for two or more layers is connected. However, the beer structure connected from the front face of a diaphragm structure to a desired conductor layer is very detailed structure to the area of a pad, and is very large. [of the area

difference of a pad and beer structure]

[0007] Under the pad, the conductor layer and insulating layer of not only beer structure but a diaphragm structure are arranged. Moreover, beer structure is prolonged only to the conductor layer which should connect, but the signal wiring of another conductor layer, i.e., a large number, is arranged through an insulating layer under the conductor layer.

When attaching the electronic instrument containing a thin film multilayer substrate in a printed circuit board etc., there is the approach of connecting the other end of a pin to a printed circuit board with soldering. In this case, unless solder is melted, an electronic instrument can be removed from a printed circuit board, or cannot be exchanged. On the other hand, a customer's device use frequency is very high, and it is desirable for the time amount required in exchange for repair or a high performance article to be also short as much as possible. Moreover, it is good for exchange to also need neither a special tool nor a special technique.

[0008] For that purpose, structure where a socket and a connector can be equipped not with soldering but with the electronic instrument containing a thin film multilayer substrate is desired. In this case, the comparable reservation of the flow with a pin and a printed circuit board must be carried out with soldering only by carrying out the pressure welding of the contact of a socket to a pin. Therefore, force which is pried will always come to be given to a pin, and the force of being dozens times many as this will be added compared with the case where it connects with soldering. In a thin film multilayer substrate, when the load was received under the harsh environment of high-humidity/temperature, the adhesion force declined by the interface between an insulating layer and a conductor layer according to moisture absorption of an insulating-layer ingredient, and the reinforcement with which it can be satisfied of reliability over a long period of time was not able to be held. However, priority was given to the device for obtaining detailed many-items child wiring in the conventional thin film multilayer substrate, and there was no device in the problem of the reinforcement produced in a pin and beer structure.

[0009] The purpose of this invention is offering the electronic instrument containing the thin film multilayer substrate and it which enabled it to secure the reinforcement for a joint of the pin used as an input/output terminal.

[0010]

[Means for Solving the Problem] The diaphragm structure which the thin film multilayer substrate by this invention becomes from two or more conductor layers prepared in an insulating substrate base material and this insulating substrate base material, and two or more insulator layers, While being prepared in this diaphragm structure, having the beer structure connected to one of two or more of the conductor layers of this diaphragm structure, and the pin connected to this beer structure and carrying out the direct laminating of the pars basilaris ossis occipitalis of this beer structure on this substrate base material, it is characterized by this pin fixing on this beer structure.

[0011] Moreover, the electronic instrument by this invention is characterized by including at least one electronic member arranged on the surface of a diaphragm structure with such a thin film multilayer substrate. In the above-mentioned configuration, beer structure consists of two or more conductor layers by which the laminating was carried out on this substrate base material, and a pin is supported with rigidity equivalent to being directly supported by the substrate base material. Moreover, there is no insulating layer in the part of beer structure in the lower part of the pin as an input/output terminal. Since there is no interface between an insulating layer and a conductor layer in a part which requires the force from a pin in this invention although there is a problem to which the adhesion force in the interface between an insulating layer and a conductor layer falls when are made from the ingredient with which an insulating layer absorbs moisture, and the force is applied from a pin to such a part, there is no fall of such adhesion force and sufficient reinforcement can be held for a long period of time. Therefore, also in the environment where a pin always receives the force, the thin film multilayer substrate and electronic instrument which have sufficient reinforcement can be offered.

[0012] The following description shall be included in the above-mentioned configuration. As for two or more conductor layers of this beer structure, the laminating of each is carried out directly, as for the conductor layer of this diaphragm structure. That is, this beer structure does not contain an insulating layer. Each area of two or more conductor layers of this beer structure is the same as the area of the edge of this pin, or larger than it.

[0013] The area of two or more conductor layers of this beer structure becomes large in order to the conductor layer which keeps away from the conductor layer near this substrate base material to this substrate base material. Nickel plating and gold plate are performed to the furthest conductor layer from this substrate base material of two or more conductor layers of this beer structure. Two or more conductor layers of this diaphragm structure are arranged on the outside of the plane of projection of the furthest conductor layer from this substrate base material of two or more conductor layers of this beer structure except for the conductor layer connected to the conductor-layer list nearest to this substrate base material of this beer structure at this beer structure.

[0014] One of two or more of the conductor layers of this diaphragm structure connected to this beer structure is

connected to beer structure within the same layer in the plane of projection of the furthest conductor layer from this substrate base material of two or more conductor layers of this beer structure, without moving in the direction which carries out a diaphragm-structure vertical. Since area is changed from the pad to which a pin is connected especially to **** to lower beer structure, partial concentration of stress does not occur in beer structure in the condition that the load of the thermal stress and connector holding power at the time of a pin joint is carried out. Moreover, since the ingredient (insulating layer) which produces a big physical-properties change with humidity does not exist under a pad, either, strong remarkable secular change are not generated. Therefore, also under the inferior environment of the bottom of high-humidity/temperature, pin bonding strength does not continue deteriorating in the long run, and realizes structure in which a socket and connector insert and remove are possible. Furthermore, pin root Motobe and a thin film front face may be coated with the ingredient which used epoxy and silicon as base resin after a pin joint to secure a tough strength.

[0015]

[Embodiment of the Invention] Drawing 3 is drawing showing the thin film multilayer substrate 10 by this invention, and the electronic instrument 30 which contains the thin film multilayer substrate 10 in a list. The thin film multilayer substrate 10 is equipped with the insulating substrate base material 12, the diaphragm structure 14 prepared on the substrate base material 12, and the pin 16 as an input/output terminal. An electronic instrument 30 becomes electronic-parts 32 lists, such as LSI carried in the thin film multilayer substrate 10 and the thin film multilayer substrate 10, from resistance, a capacitor, etc., and constitutes a multi chip module. Electronic parts 32 are joined to the conductor layer (pad) of the front face of the thin film multilayer substrate 10 by the solder bump 34.

[0016] Furthermore, such an electronic instrument 30 can be attached in the mother board 40 of a computer. In that case, a pin 16 is inserted in the connector 42 of a mother board 40, or the through hole of a printed circuit board, and a signal etc. can be transmitted between an electronic instrument 30 and a computer through a pin 16 by it. Moreover, as shown in drawing 4, a pin 16 is soldered to the pad 44 of a mother board 40, and a signal etc. can be transmitted between an electronic instrument 30 and a computer through a pin 16 by it. Also in any of the configuration of drawing 3, and the configuration of drawing 4, a load is applied to a pin 16 and there is a problem of becoming easy for the reinforcement of the diaphragm structure 14 of the thin film multilayer substrate 10 to fall. This invention solves such a trouble by the configuration described below.

[0017] In drawing 1 and drawing 2, the diaphragm structure 14 of the thin film multilayer substrate 10 consists of two or more conductor layers 18b-18f and two or more insulator layers 20a-20e. The insulator layers 20a-20e have separated two adjoining conductor layers 18b-18f, and the insulator layers 20a-20e continue mutually in the place which does not have conductor layers 18b-18f. The loading part of electronic-parts 32 grade which drawing 1 and drawing 2 expand and show the installation part of a pin 16, and is shown in drawing 3 and drawing 4 is not shown. On insulator layer 20a of the maximum upper layer, another conductor-layer 18a (it does not appear in drawing 1 and drawing 2) used as the pad for installation of electronic parts 32 is. Conductor layers 18a-18f are formed as a pattern for current supply, or a gland and signal wiring, and conductor layers 18a-18f which are different in order to connect the pattern between layers are connected with the beer structure which penetrates the insulator layers 20a-20e.

[0018] As a substrate base material 12 of the thin film multilayer substrate 10, organic materials, such as inorganic materials, such as an alumina and a mullite, or FR4, can be used. Conductor layers 18a-18f are built with metals, such as copper and aluminum, and in order to improve solder wettability, nickel plating and gold plate are performed to conductor-layer 18a used as a pad. The insulator layers 20a-20e are built with resin, such as polyimide and epoxy.

[0019] A pin 16 is connected to one [two or more conductor layers / 18b-18f / of a diaphragm structure 14] according to the beer structure 22. The beer structure 22 is connected to conductor-layer 18c of a diaphragm structure 14 in drawing 1. The beer structure 22 is connected to conductor-layer 18e of a diaphragm structure 14 in drawing 2. The conductor layers 18b-18f which should be connected become either a current supply terminal, a grand terminal and a signal terminal.

[0020] The beer structure 22 consists of two or more conductor layers 24a-24f by which the laminating was carried out on the substrate base material 12. These conductor layers 24a-24f are formed in the conductor layers 18a-18f and coincidence of a diaphragm structure 14, and the direct laminating of the 24f of the conductor layers in the pars basilaris ossis occipitalis of a diaphragm structure 14 is carried out to the substrate base material 12. The beer structure 22 is a stair-like part of the conductor layers 24a-24f, and the amount of [of a conductor layers / 24a-24f / center] flat part becomes a pad for attachment of a pin 16. The beer structure 22 is larger than a pad. In order to improve solder wettability, nickel plating and gold plate are performed to conductor-layer 24a of the maximum upper layer. They are separated from the conductor layers 24a-24f of the beer structure 22 while patterning of the conductor layers 18a-18f of a diaphragm structure 14 is carried out by for example, the photolithography process.

[0021] Therefore, two or more conductor layers 24a-24f of the beer structure 22 are formed in each conductor layer and coincidence corresponding to two or more conductor layers 18a-18f of a diaphragm structure 14, and, as for each conductor layers 24a-24f of the beer structure 22, the laminating of each is carried out directly. The beer structure 22 does not contain an insulating layer between conductor-layer 24a of the maximum upper part, and the substrate base material 12. A pin 16 is attached in the lower limit section, it has seat 16a, and mounting eye section 16a is soldered to conductor-layer 24a of the maximum upper part with solder 26.

[0022] In the above-mentioned configuration, the beer structure 22 consists of two or more conductor layers 24a-24f by which the laminating was soon carried out from the substrate base material 12, and a pin 16 is supported with rigidity equivalent to being directly supported by the substrate base material 12. Moreover, although the adhesion force in the interface between an insulating layer and a conductor layer will decline if the force is received from a pin 16 when made from the ingredient with which an insulating layer absorbs moisture, in this invention, since there is no insulating layer in the part of the beer structure 22 of the lower part of a pin 16, there is no fall of such adhesion force, pin bonding strength does not deteriorate under the inferior conditions of high-humidity/temperature, and sufficient reinforcement can be held for a long period of time.

[0023] Moreover, even if the force of a repeat is applied to a pin 16, a pin 16 sets caudad, it is not generated and the long term deterioration with the remarkable reinforcement of the thin film multilayer substrate 10 can realize structure which carries out the insert and remove of the pin 16 to the connector 32 and through hole of drawing 3. That is, in case the insert and remove of the pin 16 are carried out to a connector 32 or a through hole, the lateral force is applied to a pin 16, but in this invention, even if the lateral force is applied to a pin 16, sufficient endurance can be held. In order to consider as still tougher durable structure, after soldering a pin 16, root Motobe of a pin 16 and a thin film front face may be coated with the ingredient which used epoxy and silicon as base resin. Therefore, also in the environment where a pin always receives the force, the thin film multilayer substrate and electronic instrument which have sufficient reinforcement can be offered.

[0024] Furthermore, in an example, each two or more conductor layers [of the beer structure 22 / 24a-24f] area is the same as the area of mounting eye section 16a of the lower limit section of a pin 16, or larger than it. When a pin 16 is soldered to conductor-layer 24a of the maximum upper part, hauling thermal stress in case solder re-solidifies poses a problem. If the area of beer structure is small, a tensile stress will attain to even an insulating layer, stress concentration will happen by insulating layers, such as polyimide, and a crack etc. will be generated. The stress concentration concerning an insulating layer can be made to ease by carrying out whether it is the same as the area of mounting eye section 16a of the lower limit section of a pin 16 in the area of the beer structure 22 like [it] this example.

[0025] And two or more conductor layers [of the beer structure 22 / 24a-24f] area is large in order to the conductor layer which keeps away from 24f of conductor layers near the substrate base material 12 to the substrate base material 12. By carrying out like this, partial concentration of stress is not generated in the beer structure 22 in the condition that the load of the thermal stress and connector holding power at the time of junction of a pin 16 is carried out. For example, for the bottom of the diameter of 24f of conductor layers of 0.9mm and the lowest layer, the diameter E of conductor-layer (pad) 24a of the maximum upper layer is 0.7mm to the diameter d of 0.2mm and mounting eye section 16a of a pin 16 of the diameter D of a pin 16 being 0.4mm. A pin 16 is formed in thousands of one thin film multilayer substrates 10.

[0026] Moreover, two or more conductor layers 18b-18f of a diaphragm structure 12 are arranged on the outside of the plane of projection of furthest conductor-layer 24a from the two or more conductor layers [of the beer structure 22 / 24a-24f] substrate base material 12 except for the conductor layer connected to 24f list of conductor layers nearest to the substrate base material 12 of the beer structure 22 at the beer structure 22. That is, under conductor-layer 24a of the maximum upper part used as a pad, by not placing wiring other than wiring which should be connected and carrying out it, the interface between an insulating layer and a conductor layer is made not to be made within limits considered that the force from a pin 16 is applied, and possibility that concentration of stress will arise is reduced as much as possible.

[0027] Moreover, one [two or more conductor layers / 18b-18f / of the diaphragm structure 14 connected to the beer structure 22] is connected to the beer structure 22 within the same layer in the plane of projection of furthest conductor-layer 24a from the two or more conductor layers [of the beer structure 22 / 24a-24f] substrate base material 12, without moving in the direction which carries out a vertical to a diaphragm structure 22. That is, the stress concentration to a pattern also becomes avoidable by forbidding a change of a signal near the beer structure 22.

[0028]

[Effect of the Invention] As explained above, even if it is the pin connected on a diaphragm structure, according to this invention, the thin film multilayer substrate and electronic instrument which can bear a high-humidity/temperature

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CLAIMS

[Claim(s)]

[Claim 1] The diaphragm structure which consists of two or more conductor layers prepared in an insulating substrate base material and this insulating substrate base material, and two or more insulator layers, It is the thin film multilayer substrate which is formed in this diaphragm structure, is equipped with the beer structure connected to one of two or more of the conductor layers of this diaphragm structure, and the pin connected to this beer structure, and is characterized by this pin fixing it on this beer structure while the direct laminating of the pars basilaris ossis occipitalis of this beer structure is carried out on this substrate base material.

[Claim 2] It is the thin film multilayer substrate according to claim 1 with which two or more conductor layers of this beer structure correspond with two or more conductor layers of this diaphragm structure, and this conductor layer of this beer structure is characterized by carrying out the direct laminating of each.

[Claim 3] Each area of two or more conductor layers of this beer structure is a thin film multilayer substrate according to claim 2 characterized by being the same as the area of the edge of this pin, or being larger than it.

[Claim 4] The area of two or more conductor layers of this beer structure is a thin film multilayer substrate according to claim 3 characterized by becoming large in order to the conductor layer which keeps away from this substrate base material from the conductor layer near this substrate base material.

[Claim 5] The furthest conductor layer from this substrate base material of two or more conductor layers of this beer structure is a thin film multilayer substrate according to claim 4 characterized by performing nickel plating and gold plate.

[Claim 6] Two or more conductor layers of this diaphragm structure are thin film multilayer substrates according to claim 4 characterized by being arranged on the outside of the plane of projection of the furthest conductor layer from this substrate base material of two or more conductor layers of this beer structure except for the conductor layer connected to the conductor-layer list nearest to this substrate base material of this beer structure at this beer structure.

[Claim 7] One of two or more of the conductor layers of this diaphragm structure connected to this beer structure is a thin film multilayer substrate according to claim 4 characterized by connecting with beer structure within the same layer, without moving in the direction which carries out a diaphragm-structure vertical in the plane of projection of the furthest conductor layer from this substrate base material of two or more conductor layers of this beer structure.

[Claim 8] The diaphragm structure which consists of two or more conductor layers prepared in an insulating substrate base material and this insulating substrate base material, and two or more insulator layers, At least one electronic member arranged on the front face of this diaphragm structure, and the beer structure which is established in this diaphragm structure and connected to one of these two or more of the conductor layers, It is the electronic instrument which is equipped with the pin connected to this beer structure, and is characterized by this beer structure consisting of two or more conductor layers by which the laminating was carried out on this substrate base material.

[Translation done.]